SWOSU Invests in Chemistry Instrumentation Due to Futures Under Construction Bond Issue

09.20.2007

Southwestern Oklahoma State University chemistry student Amy Cain of Indiahoma works with SWOSU Assistant Professor Dr. Tim Hubin on the new Gas Chromatograph Mass Spectrometer that was purchased by SWOSU as an effort to enhance the SWOSU Chemistry & Physics Department's capabilities for teaching and research. The equipment was made possible by the "Futures Under Construction" higher education capital bond issue that was signed into law in 2005.

When Southwestern Oklahoma State University chemistry faculty and students returned to classes this fall on the Weatherford campus, they found over $250,000 worth of new instrumentation waiting for them.

Thanks to the “Futures Under Construction” higher education capital bond issue that was signed into law in 2005, SWOSU was able to invest in enhancing the department’s capabilities for teaching and research. The main expenditures were for two state-of-the art analytical instruments: a Nuclear Magnetic Resonance Spectrometer (or NMR); and a Gas Chromatograph Mass Spectrometer (or GCMS).

Dr. Tim Hubin, assistant professor of chemistry in the SWOSU Department of Chemistry & Physics, said both instruments are extremely powerful tools for analyzing the identity and purity of chemical samples.

The NMR uses a powerful magnetic field in conjunction with radio frequency light to produce a spectrum, much like a fingerprint, of a molecular sample. Trained chemists and/or chemistry students in training can interpret the spectrum to decipher the structure of the molecule under investigation.

Hubin said an NMR is very similar to the medically useful MRI (Magnetic Resonance Imaging) instruments now found in virtually every hospital radiology department. The difference is that MRI’s only look at water molecules, using the different environments of water in different tissues to produce a medically useful image, much like an X-Ray.

An NMR is capable of examining essentially any molecule, not just water, and presents the information in a more chemically, rather than visually, useful way.

“This analytical technique has become probably the most powerful tool that chemists have to determine the structure of molecules.” Hubin said. “The department faculty felt strongly that SWOSU undergraduates should have the opportunity to learn this technique on a high quality instrument.”

The instrument will also support the growing research program within the department, especially for synthetic chemists and their students, who are designing and synthesizing new molecules.

The GCMS is actually two instruments linked together, a so-called tandem instrument, that is also exceedingly powerful for determining what is in a sample. GC (gas chromatography) is a separation technique in which all the components of a mixture are vaporized and then pushed through a long narrow tube (or column). The different molecules move at different speeds through the column and are thus separated.

GC's are relatively simple and inexpensive, and the Chemistry Department already makes use of several of these in the Organic Chemistry program. What makes the GCMS so much more powerful is its ability to identify each component of that mixture as it exits the column, according to Hubin.

MS (mass spectrometry) is an analytical technique in which molecules are bombarded with electrons to give them a charge. The charged particles are then pulled through a chamber of complex magnetic and electrical fields that lets only one mass (or weight) of particles through at a time. A mass spectrum (a different kind of molecular fingerprint) can then be interpreted to tell what each component that exits the GC column is, by comparison to a library of known chemical compounds.

Hubin said this technique is widely used in forensic and drug testing labs. Now, SWOSU students will be able to learn how to use the instrument and interpret the results. Again, research in the chemistry department will also be enhanced by the availability of such a powerful technique.